

IN THE CLAIMS:

Please amend Claims 1, 4-7, 21, 22 and 23 as follows. A marked-up version of the amended claims, showing the changes made thereto, is attached. For the Examiner's convenience, all of the pending claims are presented, regardless of whether the claims is currently being amended.

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1. (Amended) An information processing apparatus that derives the calibration information needed to measure the position and/or attitude of a measuring object based on the output values of a position and/or attitude sensor which is used by a mixed reality display device, comprising:

an input unit adapted to enter information about a match between the position and/or attitude of a real image of a measuring object and a position and/or attitude of a virtual image of the measuring object;

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an acquisition unit adapted to acquire the output values from the position and/or attitude sensor according to the input by said input unit; and

an operation unit adapted to derive the calibration information, based on the predetermined position and/or attitude and the output values of the position and/or attitude sensor acquired by said acquisition unit.

2. (Unamended) The information processing apparatus according to claim 1, wherein:

said position and/or attitude sensor has been connected directly or indirectly to said measuring object and the output values of said sensor are information that represents the position and/or attitude of said sensor itself in the sensor coordinate system; and

said calibration information contains first coordinate transformation information for converting the position and/or attitude of said sensor itself in the sensor coordinate system into the position and/or attitude of said measuring object in the sensor coordinate system and second coordinate transformation information for converting the position and/or attitude in the sensor coordinate system into the position and/or attitude in a global coordinate system.

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3. (Unamended) The information processing apparatus according to claim 1, further comprising guiding means for guiding said measuring object to said predetermined position and/or attitude.

4. (Amended) The information processing apparatus according to claim 2, wherein:

the measurement of said position and/or attitude is measurement of position and attitude, and said sensor is a position and attitude sensor; and

said operation unit performs the process of determining attitude information among said first coordinate transformation information and position information among said second coordinate transformation information.

5. (Amended) The information processing apparatus according to claim 2,
wherein:
the measurement of said position and/or attitude is measurement of only attitude,
and said sensor is an attitude sensor; and
said operation unit performs the process of determining pitch-angle and roll-angle
information among said first coordinate transformation information and yaw-angle
information among said second coordinate transformation information.

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6. (Amended) The information processing apparatus according to claim 2,
wherein:
the measurement of said position and/or attitude is measurement of only attitude,
and said sensor is an attitude sensor; and
said operation unit performs the process of determining yaw-angle information
among said second coordinate transformation information.

7. (Amended) ~~The~~ information processing apparatus according to claim 1,
wherein said measuring object is a magnetic sensor.

8. (Unamended) The information processing apparatus according to claim 1,
wherein said measuring object is the viewpoint of the user observing a display device that
displays virtual space superimposed over the real space transmitted optically through a
display screen.

9. (Unamended) The information processing apparatus according to claim 1, wherein said measuring object is the viewpoint of an imaging means for capturing real space.

10. (Unamended) The information processing apparatus according to claim 8, wherein said guiding means comprises:

geometry information storage means for storing geometry information of an object;

picture generation means for calculating the two-dimensional appearance of said object expected to be observed on said display screen when said user observes said display screen in said predetermined position/attitude, based on said predetermined position/attitude of said viewpoint and the geometry information of said object stored in said geometry information storage means to generate its picture; and

picture presentation means for presenting said picture generated by said picture generation means on said display screen; and wherein

said information processing apparatus moves the viewpoint of said user to said predetermined position/attitude by moving it such that the image of real space observed through said display screen and the image of said object displayed on said display screen will match geometrically on said display screen.

11. (Unamended) The information processing apparatus according to claim 9, wherein said guiding means comprises:

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geometry information storage means for storing geometry information of an object;

picture generation means for calculating the two-dimensional appearance of said object expected to be observed on said display screen when said imaging means captures real space in said predetermined position/attitude, based on said predetermined position/attitude of said viewpoint and the geometry information of said object stored in said geometry information storage means, and superimposing its picture over the picture of real space captured by said imaging means to generate a superimposed picture; and

picture presentation means for presenting said superimposed picture generated by said picture generation means to the operator; and wherein

said operator moves the viewpoint of said imaging means to said predetermined position/attitude by moving said imaging means in such a way that the picture of said real space and image of said object superimposed over it will match geometrically on said superimposed picture presented by said picture presentation means.

12. (Unamended) The information processing apparatus according to claim 1, wherein said guiding means comprises:

imaging means for capturing real space, having a viewpoint whose relative position/attitude with respect to said measuring object is known;

geometry information storage means for storing geometry information;

picture generation means for calculating the two-dimensional appearance of said object expected to be observed on said display screen when said imaging means captures real space in said predetermined position/attitude, based on the position/attitude of the

viewpoint of said imaging means determined from said predetermined position/attitude of said measuring object and said relative position/attitude as well as on the geometry information of said object stored in said geometry information storage means, and superimposing its picture over the picture of real space captured by said imaging means to generate a superimposed picture; and

picture presentation means for presenting said superimposed picture generated by said picture generation means to the operator; and wherein

said operator moves said measuring object to said predetermined position/attitude by moving said imaging means in such a way that the picture of said real space and image of said object superimposed over it will match geometrically on said superimposed picture presented by said picture presentation means.

13. (Unamended) The information processing apparatus according to claim 10, wherein said object contains markers placed in real space and said geometry information contains position information of said markers.

14. (Unamended) The information processing apparatus according to claim 10, wherein said object has an area or volume in real space and said geometry information contains shape information of the object.

15. (Unamended) The information processing apparatus according to claim 14, wherein said picture generation means draws a wire frame image of said object.

16. (Unamended) The information processing apparatus according to claim 10, wherein said object contains a virtual object to be superimposed over real space.

17. (Unamended) A mixed reality presentation apparatus which display virtual space superimposed over a picture of captured real space on a display screen or displays virtual space superimposed over the real space transmitted optically through a display screen, based on the output values of a position and/or attitude sensor, comprising:

an information processing apparatus according to claim 10; and

switching means for switching between presentation mode that presents mixed reality and derivation mode that derives calibration information; wherein

the calibration information needed for presentation of said mixed reality is derived in said derivation mode and mixed reality is presented using the calibration information in said presentation mode.

18. (Unamended) The mixed reality presentation apparatus according to claim 17, wherein said apparatus presents a wire frame of marker locations or objects, etc. in addition to, or in place of, all or part of what is superimposed in said presentation mode.

19. (Unamended) The mixed reality presentation apparatus according to claim 17, wherein said apparatus shares all or part of the object's geometry information used for said derivation mode with said presentation mode.

20. (Unamended) The mixed reality presentation apparatus according to claim 17,
wherein display means is shared between said derivation mode and said presentation mode.

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21. (Amended) An information processing apparatus that derives the calibration information needed to measure the position and/or attitude of a measuring object based on the output values of a position and/or attitude sensor which is used by a mixed reality display device, comprising:

an input unit adapted to enter information about a match between the position and/or attitude of a real image of a measuring object and a position and/or attitude of a virtual image of the measuring object;

an acquisition unit adapted to acquire the output values from the position and/or attitude sensor according to the input by said input unit; and

an operation unit adapted to derive the calibration information, based on the predetermined position and/or attitude and the output values of the position and/or attitude sensor acquired by said acquisition unit.

22. (Amended) A mixed reality presentation method which displays virtual space superimposed over a picture of captured real space on a display screen or display virtual space superimposed over the real space transmitted optically through a display screen, based on the output values of a position and/or attitude sensor, comprising:

an information processing method performed using the apparatus of claim 21; and
switching process of switching between presentation mode that presents mixed reality and derivation mode that derives calibration information; wherein